

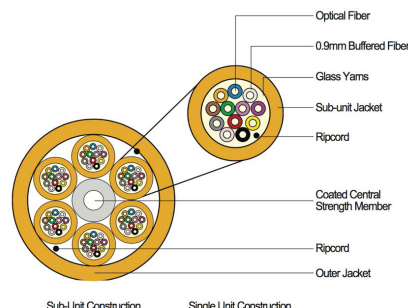
# Fiber Optics

## Breakout Tight Buffered Cable



### Features and Benefits

- Fiber-count 2-144 fibers
- 900 microns buffered design for easy termination
- Tight buffered construction
- Plenum (OFNP / FT6), LSZH Riser OFNR (FT-4-ST1)
- OS2, OM3 and OM4 performance types
- Color-coded fibers for easy identification
- Compact design for limited conduit space
- RoHS compliant



### Overview

PPC fiber optic tight buffered cables are rugged, high performance optical communication cables suitable for inside plant installations. These cables are ideally used in backbone or computer room / datacenter cabling.

The fiber optic tight buffered cable contains 2 to 144 fibers individually buffered to 900µm in a tight buffer construction and color coded as per Telcordia requirements.

The cable structure depends on the number of fibers and is available as an individual and subunit construction. The 2 to 24 fiber cables contain individual 900µm fibers without sub-units, the individual fibers are protected by glass yarn, contains a rip cord and an overall jacket. In the 18 to 36 fiber cables, the fibers are grouped into sub-units which are laid helically along the cable axis. Each subunit contains 6 fibers surrounded by glass yarn, ripcord and an overall jacket. The 48 ~ 144 fiber cable consists of twelve fibers in each sub-unit.

The cable is available in a wide range of jacket such as LSZH, riser grade and plenum. A ripcord is located under the sub-unit and outer jacket to facilitate jacket removal.

### Technical Data

#### Optical Characteristics: Singlemode-9µmOS2-G.652D, G.657A/B

| Fiber Type                    |                          | Unit<br>nm | OS2 G.652D  |            | G.657A      |             | G.657B      |             |
|-------------------------------|--------------------------|------------|-------------|------------|-------------|-------------|-------------|-------------|
| Wavelength                    |                          |            | 1310        | 1550       | 1310        | 1550        | 1310        | 1550        |
| Attenuation                   |                          | dB/km      | ≤ 0.35      | ≤ 0.21     | ≤ 0.35      | ≤ 0.21      | ≤ 0.35      | ≤ 0.21      |
| Chromatic dispersion          |                          | ps/nm.km   | ≤ 3.5       | ≤ 18       | ≤ 3.5       | ≤ 18        | ≤ 3.5       | ≤ 18        |
| Zero dispersion wavelength    |                          | nm         | 1300 ~ 1324 |            | 1300 ~ 1324 |             | 1300 ~ 1324 |             |
| Zero dispersion slope         |                          | ps/nm2.km  | ≤ 0.092     |            | ≤ 0.092     |             | ≤ 0.092     |             |
| PMD                           |                          | ps/√km     | ≤ 0.2       |            | ≤ 0.2       |             | ≤ 0.2       |             |
| Cut-off wavelength            |                          | nm         | ≤ 1260      |            | ≤ 1260      |             | ≤ 1260      |             |
| Mode-field diameter           |                          | μm         | 9.2 ± 0.4   | 10.4 ± 0.5 | 8.6 ± 0.4   | 10.4 ± 0.5  | 8.6 ± 0.4   | 10.4 ± 0.5  |
| Macro Bend Loss               | 30mm radius x 100 turns  | dB         | -           | ≤ 0.05     | -           | -           | -           |             |
|                               | 15mm radius x 100 turns  |            | -           | -          | -           | ≤ 0.25/0.03 | -           | ≤ 0.03/0.03 |
|                               | 10mm radius x 100 turns  |            | -           | -          | -           | ≤ 0.75/0.1  | -           | ≤ 0.1/0.08  |
|                               | 7.5mm radius x 100 turns |            | -           | -          | -           | -           | -           | ≤ 0.5/0.15  |
| Core/Clad Concentricity Error |                          | μm         | ≤ 0.8       |            | ≤ 0.6       |             | ≤ 0.6       |             |
| Cladding Diameter             |                          | μm         | 125 ± 1     |            | 125 ± 1     |             | 125 ± 1     |             |
| Cladding Non-circularity      |                          | %          | ≤ 1.0       |            | ≤ 1.0       |             | ≤ 1.0       |             |
| Coating Diameter              |                          | %          | 245 ± 15    |            | 245 ± 15    |             | 245 ± 15    |             |
| Proof Test Level              |                          | Kpsi       | ≥ 100       |            | ≥ 100       |             | ≥ 100       |             |

# Fiber Optics

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### Optical Characteristics: Multimode - 62.5µm (OM1), 50µm (OM2, OM3, OM4)

| Fiber Type<br>Wavelength                               | nm      | OM1           |       | OM2          |       | OM3          |       | OM4          |       |
|--|---------|---------------|-------|--------------|-------|--------------|-------|--------------|-------|
|  |         | 850           | 1300  | 850          | 1300  | 850          | 1300  | 850          | 1300  |
| Attenuation  | dB/km   | ≤ 3.5         | ≤ 1.0 | ≤ 3.0        | ≤ 1.0 | ≤ 3.0        | ≤ 1.0 | ≤ 3.0        | ≤ 1.0 |
| Over filled Launch Bandwidth (LED based sources)       | MHz.k m | ≤ 200         | ≤ 500 | ≤ 500        | ≤ 500 | ≤ 1500       | ≤ 500 | ≤ 3500       | ≤ 500 |
| Effective Modal Bandwidth (850 nm Laser based sources) | MHz.k m | -             |       | -            |       | ≤ 2000       |       | ≤ 4700       |       |
| Numerical aperture                                     | -       | 0.275 ± 0.015 |       | 0.20 ± 0.015 |       | 0.20 ± 0.015 |       | 0.20 ± 0.015 |       |
| Core diameter  | µm      | 62.5 ± 3.0    |       | 50 ± 3.0     |       | 50 ± 3.0     |       | 50 ± 3.0     |       |
| Core Non-Circularity                                   | %       | ≤ 6.0         |       | ≤ 6.0        |       | ≤ 6.0        |       | ≤ 6.0        |       |
| Cladding diameter                                      | µm      | 125 ± 2.0     |       | 125 ± 2.0    |       | 125 ± 2.0    |       | 125 ± 2.0    |       |
| Cladding Non- Circularity                              | %       | ≤ 2.0         |       | ≤ 2.0        |       | ≤ 2.0        |       | ≤ 2.0        |       |
| Core / Cladding Concentricity Error                    | µm      | ≤ 3.0         |       | ≤ 3.0        |       | ≤ 3.0        |       | ≤ 3.0        |       |
| Coating diameter                                       | µm      | 245 ± 5.0     |       | 245 ± 5.0    |       | 245 ± 5.0    |       | 245 ± 5.0    |       |
| Proof test level                                       | Kpsi    | ≤ 100         |       | ≤ 100        |       | ≤ 100        |       | ≤ 100        |       |

### Transmission Performance

| Application                            | OS1/OS2<br>Singlemode<br>(1310/1383/1550) | OM1<br>Multimode<br>(850/1300) | OM2<br>Multimode<br>(850/1300) | OM3<br>Multimode<br>(850/1300) | OM4<br>Multimode<br>(850/1300) |
|--|---|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| 100Base-FX, Ethernet, @ 1300nm         | -   | 2000m                          | 2000m                          | 2000m                          | 2000m                          |
| 100Base-LX, @ 1310nm                   | 10000m                                    | -                              | -                              | -                              | -                              |
| 1000Base-SX, Gigabit, Ethernet @ 850nm | -   | 275m                           | 550m                           | 550m                           | 550m                           |
| 100Base-LX, Gigabit Ethernet, @ 1310nm | 1000m                                     | 550m                           | 550m                           | 550m                           | 550m                           |
| 10GBase-SR, 10Gbps @ 850nm             | -   | 33m                            | 82m                            | 300m                           | 550m                           |
| 10GBase-LR, 10Gbps @ 1310nm            | 1000m                                     | -                              | -                              | -                              | -                              |
| 40GBase-SR, 40Gbps @ 850nm             | -   | -                              | -                              | 100m                           | 150m                           |
| 40GBase-LR4, 40Gbps @ 1310nm           | 1000m                                     | -                              | -                              | -                              | -                              |
| 100GBase-SR10, 100Gbps @ 850nm         | -   | -                              | -                              | 100m                           | 150m                           |
| 100Base-LR4, 100Gbps, @ 1310nm         | 1000m                                     |                                |                                |                                |                                |
| 100Base-ER4, 100Gbps, @ 1550nm         | 30000m                                    | -                              | -                              | -                              | -                              |

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### Physical Data

| Construction | No. of fibers | Nominal cable diameter<br>mm | Nominal weight<br>Kg/Km | Maximum tensile load |                | Crush load         |                   | Min. bend radius |                 |
|--------------|---------------|------------------------------|-------------------------|----------------------|----------------|--------------------|-------------------|------------------|-----------------|
|              |               |                              |                         | Short term<br>N      | Long term<br>N | Short term<br>N/cm | Long term<br>N/cm | Loaded<br>mm     | Installed<br>mm |
| Single-Unit  | 2             | 4.5                          | 25                      | 660                  | 165            | 50                 | 50                | 70               | 45              |
|              | 4             | 5.3                          | 30                      | 660                  | 165            | 50                 | 50                | 85               | 55              |
|              | 6             | 5.7                          | 35                      | 660                  | 165            | 50                 | 50                | 90               | 60              |
|              | 8             | 6.0                          | 40                      | 660                  | 165            | 50                 | 50                | 90               | 60              |
|              | 12            | 6.7                          | 50                      | 660                  | 165            | 50                 | 50                | 105              | 70              |
|              | 16            | 8.4                          | 70                      | 1320                 | 330            | 50                 | 50                | 130              | 85              |
|              | 18            | 8.9                          | 75                      | 1320                 | 330            | 50                 | 50                | 180              | 90              |
|              | 24            | 9.8                          | 75                      | 1320                 | 330            | 100                | 100               | 150              | 100             |
| Multi-Unit   | 24            | 14.8                         | 155                     | 1320                 | 375            | 100                | 100               | 225              | 150             |
|              | 36            | 17.3                         | 250                     | 1320                 | 330            | 100                | 100               | 250              | 175             |
|              | 48            | 18.7                         | 270                     | 1320                 | 330            | 100                | 100               | 380              | 190             |
|              | 72            | 22.5                         | 425                     | 1320                 | 330            | 100                | 100               | 450              | 225             |
|              | 96            | 26.2                         | 565                     | 1320                 | 330            | 100                | 100               | 530              | 265             |
|              | 120           | 30.7                         | 620                     | 1320                 | 330            | 100                | 100               | 620              | 310             |
|              | 144           | 29.8                         | 730                     | 1320                 | 330            | 100                | 100               | 600              | 300             |

### Environmental Data

| Temperature range | Value             |
|-------------------|-------------------|
| Storage           | - 20° C to +70° C |
| Operation         | - 10° C to +60° C |

### Mechanical Data

| Description             | Standards         | Value  |
|-------------------------|-------------------|--|
| Tensile Load / Strength | IEC 60794-1-2-E1  | Single unit: 2~12F 18~24F Multi-unit: 18~144F660N for 30 minutes 1320N for 30 minutes 1500N for 30 minutes                   |
| Crush Resistance        | IEC 60794-1-2-E3  | Single unit: 2 ~ 18F 500N/10 cm for 10 minutes 24F 1000N/10cm for 10 minutes Multi-unit: 24~ 144F 1000N/10 cm for 10 minutes |
| Impact Resistance       | IEC 60794-1-2-E4  | 1 impacts @ 3 points, 5Nm /5J 0.5kg for 2~12 F 2kg for 16~144 F  |
| Torsion Test            | IEC 60794-1-2-E7  | ± 180°, ± 1 turn/2m  |
| Cable Bend              | IEC 60794-1-2-E11 | 20 D for 4 turns, 10 Cycles  |
| Temperature Cycling     | IEC 60794-1-2-F1  | 25°C → -20°C → 50°C → -20°C → 50°C → 25°C  |

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### Cable Construction

#### Construction of single unit cables

| Description                |           | Value   |
|----------------------------|-----------|---|
| Number of fibers           |           | 2-24  |
| Type of fiber              |           | Singlemode – 9/125 $\mu\text{m}$ (OS2 G.652D), G.657A1/A2, B1, B2<br>Multimode – 62.5/125 $\mu\text{m}$ (OM1), 50/125 $\mu\text{m}$ (OM2, OM3, OM4) |
| Tight Buffer Coating       |           | Outer diameter: 900 $\pm$ 50 $\mu\text{m}$  |
| Dielectric Strength Member |           | Glass yarn  |
| Ripcord                    |           | One ripcord (for 6 - 24 fiber cable)  |
| Outer Jacket Material      | Material  | LSZH Compound   |
|                            | Thickness | Nominal 1mm   |

#### Construction of multi-unit cables

| Description                |                            | Value   |
|----------------------------|----------------------------|---|
| Number of fibers           |                            | 18-144  |
| Type of fiber              |                            | Singlemode – 9/125 $\mu\text{m}$ (OS2 G.652D), G.657A1/A2, B1, B2<br>Multimode – 62.5/125 $\mu\text{m}$ (OM1), 50/125 $\mu\text{m}$ (OM2, OM3, OM4) |
| Tight Buffer Coating       |                            | Outer diameter: 900 $\pm$ 50 $\mu\text{m}$  |
| Sub-unit                   | No. of tight buffers       | 6 Fiber: For 18 ~ 36 Fiber Cable 12 Fiber: For 48 ~ 144 Fiber Cables  |
|                            | Dielectric strength member | Glass yarn  |
|                            | Sub-unit jacket            | LSZH compound   |
| Dielectric strength member |                            | FRP or FRP with LSZH coating  |
| Ripcord                    |                            | Two ripcords  |
| Outer Jacket Material      | Material                   | LSZH Compound   |
|                            | Thickness                  | Nominal 1mm   |

### Color of Buffer

|             |             |                        |                        |
|-------------|-------------|------------------------|------------------------|
| 01 – Blue   | 07 – Red    | 13 – Blue/Black dash   | 19 – Red/Black dash    |
| 02 – Orange | 08 – Black  | 14 – Orange/Black dash | 20 – Black/White dash  |
| 03 – Green  | 09 – Yellow | 15 – Green/Black dash  | 21 – Yellow/Black dash |
| 04 – Brown  | 10 – Violet | 16 – Brown/Black dash  | 22 – Violet/Black dash |
| 05 – Grey   | 11 – Pink   | 17 – Grey/Black dash   | 23 – Pink/Black dash   |
| 06 – White  | 12 – Aqua   | 18 – White/Black dash  | 24 – Aqua/black dash   |

# Fiber Optics

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### Ordering Information

FC

3

4-6

7-8

9-11

12

|        |   |        |   |     |   |
|--------|---|--------|---|-----|---|
| 03.    | Fiber Type<br>1 = OM1<br>2 = OM2<br>3 = OM3<br>4 = OM4<br>5 = OM5<br>S = G.652D<br>A = G.657A1- BIF 10mm<br>N = G.657A2- BIF 7.5mm<br>B = G.657B3- BIF 5mm<br>G = G.655 | 07-08. | Armouring Type<br>NA = Nonarmour  | 12. | Jacket Material<br>L = LSZH<br>V = PVC<br>R = Riser<br>P = Plenum |
| 04-06. | Cable Type<br>TBC = Tight Buffer Cable  | 09-11. | Fiber Count<br>004 = 4F<br>006 = 6F<br>008 = 8F<br>016 = 16F<br>024 = 24F<br>048 = 48F<br>096 = 96F<br>144 = 144F<br>288 = 288F<br>576 = 576F |     |   |